Medical student education in sleep and its disorders: still meagre 20 years on

A cross-sectional survey of UK undergraduate medical education

Running Head:

Sleep still neglected in the medical curriculum

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Author contributions

Stephanie Romiszewski, designed the study, processed and analysed data, wrote and reviewed the paper. She is the Guarantor.

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Elizabeth Jane Homan collected and processed the data and reviewed the paper.

Ben Norris, collected the data, processed the data and reviewed the paper.

Michelle Miller, designed the study and reviewed the paper.

Adam Zeman, designed the study, processed and analysed data, wrote and reviewed the paper.

Ethics

Ethical approval was obtained from the Exeter University Medical School ethics committee; no patients were involved as participants in this study.

Patient and public involvement

There was no significant collaboration with the general public or patients in this study, beyond the ethics approval process.

Rights

Transparency statement

The guarantor, Stephanie Romiszewski, confirms that the manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as originally planned have been explained.

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Summary

Sleep is a pillar of health, alongside adequate nutrition and exercise. Problems with sleep are common, and often treatable, improving lives. Twenty years ago, UK medical school education on sleep disorders had a median teaching time of 15 minutes: we investigate whether education has improved.

This is a cross-sectional survey, including time spent on teaching sleep medicine, sub-topics covered, and forms of assessment. 34 medical degree courses in the UK were polled. We excluded responses not concerned with general undergraduate education (i.e. optional modules).

Twenty-five (74%) medical schools responded. Time spent teaching undergraduates sleep medicine was median 1.5hr, mode <1hr, mean 3.2hr (standard deviation = 2.6). Only two schools had a syllabus or core module (8%), and five (22%) were involved in sleep disorders research. Despite the above, half of respondents thought provision was sufficient. Free-text comments had recurring themes: sleep medicine is subsumed into other specialties, obstructive sleep apnoea dominates teaching, knowledge of sleep disorders is optional, and there is inertia to change. A substantial minority of respondents were enthusiastic about improving provision.

In conclusion, little has changed over 20 years: sleep medicine is neglected despite agreement on its importance for general health. Sleep research is the exception rather than the rule. Obstacles to change include views that “sleep is not a core topic”, or the “curriculum is too crowded”. However, there is enthusiasm for improvement. We recommend establishment of a sleep medicine curriculum. Without better teaching doctors will remain ill-equipped to recognise and treat these common conditions.

Keywords:

Sleep medicine, Undergraduate education, Medical Students, Syllabus, United Kingdom

Abstract

Sleep is a pillar of health, alongside adequate nutrition and exercise. Problems with sleep are common, and often treatable, improving lives. Twenty years ago, UK medical school education on sleep disorders had a median teaching time of 15 minutes: we investigate whether education has improved.

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Little has changed over 20 years: sleep medicine is neglected despite agreement on its importance for general health. Sleep research is the exception rather than the rule. Obstacles to change include views that “sleep is not a core topic”, or the “curriculum is too crowded”. However, there is enthusiasm for improvement. We recommend establishment of a sleep medicine curriculum. Without better teaching doctors will remain ill-equipped to recognise and treat these common conditions.

Introduction

We spend around a third of our lives asleep. Primary sleep disorders are common: for example the most frequent medical cause of excessive daytime sleepiness, Obstructive Sleep Apnoea-Hypopnoea Syndrome (OSA), occurs in 4% of men, and 2% of women (Greenstone & Hack, 2014), whilst chronic insomnia affects 10% of the population (Ferrie, Kumari, Salo, Singh-Manoux, & Kivimäki, 2011), and disturbed behaviour during sleep - the 'parasomnias' – occurs in 2-7% of the adult population (Bjorvatn, Grønli, & Pallesen, 2010). Sleep disturbance is an integral and important part of many other medical and psychiatric conditions, from obesity and Parkinson's disease to depression and schizophrenia. The societal cost of sleep problems is high, through working days lost, accidents caused, and lives shortened. Sleep disorders alone may reduce worldwide gross domestic product by 1.5-3% (Hafner, Stepanek, Taylor, Troxel, & van Stolk, 2017).

There is growing recognition of the importance of sound sleep as a pillar of health, alongside adequate nutrition and exercise. Moreover, there are effective, evidence-based, guideline-recommended treatments for many sleep disorders, including for example continuous positive airways pressure (CPAP) in obstructive sleep apnoea (NICE, 2008), sodium oxybate in narcolepsy (Zeman & Zaiwalla, 2016), and cognitive behaviour therapy for insomnia(National Institute for Health and Care Excellence, 2015). Yet doctors around the world have traditionally been educated poorly, if at all, in sleep medicine (Mindell et al., 2011; Rosen, Rosekind, Rosevear, Cole, & Dement, 1993; Stores & Crawford, 1998). Patients report that doctors neglect sleep-related symptoms and disorders, while doctors report that they are inadequately trained to deal with them (Dyas et al., 2010).

In 1998 Stores & Crawford reported from their UK based survey, with a 71% response rate, that the median time allocation to education in sleep disorders was 15 minutes (Stores & Crawford, 1998). Explanations included crowding in the existing curriculum, that sleep is not a 'core subject', and insufficient expertise. The purpose of our study was to establish whether education in sleep medicine has improved over the twenty years since this question was last studied in the UK. Our hypothesis was that little has changed to improve education of new doctors, despite the emerging evidence of sleep's pivotal role in health.

Methods

Design

Our cross-sectional study approached principal contacts for 34 UK medical degree courses, with a survey adapted from Stores and Crawford's 1998 paper. We use the term 'medical degree course' to refer to the whole undergraduate period of training for a doctor; we do not distinguish between pre-clinical and clinical components.

Measures

The survey consisted of 11 questions: 7 multiple choice, 1 numerical and 3 inviting free text responses, with optional additional free text space for all questions. The complete survey questionnaire is available (see Appendix 2).

Procedure

Responses were sought through email, and non-responders followed up. Duplicate responses from the same school were included and merged. Responses were excluded if answers were: not representative of the whole medical degree (for example, concerning post-graduate or optional modules, n = 3), or mostly incomplete (n = 2). We filtered out information on optional components for small numbers of students from our main analysis, because these will not affect the majority of future doctors, but have included some details about these opportunities.

Analysis

We calculated proportions of coded responses based total responders for that question. Where ranges were coded, the midpoint was used to calculate basic statistics. We performed a thematic analysis of free text answers to summarise the breadth of comments and draw out both common and outlying themes (Nowell, Norris, White, & Moules, 2017). Where quotes are used, they have been edited for conciseness and to remove identifiers. Missing data was excluded.

-Figure 1

Results

Participants

Response rate was 74%. Table 1 and Figure 1 indicate the sources of our study data. Respondents were: 12 directors or deputy/associate course directors (48%), 8 lecturers or professors (32%), 3 deans or deputies (12%), and 2 phase leads (8%).

Table 1 - Responding medical schools

Aberdeen	Exeter	Nottingham
Bart's & The London	Glasgow	Queen's, Belfast
Brighton and Sussex	Hull and York	Sheffield
Bristol	Kings College	St Andrews
Cardiff	Lancaster	St George's, London
Durham	Leeds	Swansea
Norwich	Leicester	University College London
Edinburgh	Manchester	Warwick

Responses

Total time spent teaching about sleep medicine:

The total time devoted to teaching sleep medicine was median 1.5 hours, mode <1 hour, and mean 3.2 hours (standard deviation = 2.6). The data were positively skewed, with two outliers offering significantly more, at 9-10 hours (see figure 2; note these two outliers taught primarily on respiratory sleep disorders). Three (12%) answered "Do not know".

-Figure 2

Dedicated sleep syllabus or modules:

Only two schools reported a sleep medicine syllabus or dedicated compulsory module (8%), whilst two had optional student-selected sleep medicine modules (8%). These optional modules were for eight students in years 3-4, and for 12 students in year 2.

Sub-topics explicitly covered in the curriculum:

Respiratory sleep medicine was the best represented topic (86%), non-specified disorders the worst (12%), and paediatric topics the second worst (29%, see Figure 3).

-Figure 3

Assessment methods:

Knowledge of sleep medicine was assessed with multiple choice exams by 86%, while 23% used essays within examinations and 19% used essays as part of their assessment framework in coursework.

Teaching formats, sources, and instructional materials:

Clinical bedside teaching was the joint commonest method (56%) with large lectures (56%), followed by seminar groups (40%). Textbooks were used most commonly for source material (24%) followed by articles (12%). For instructional materials, slide presentations were commonest (52%), followed by use of video (4%).

Specific resources or teaching materials that would improve or complement teaching:

38% agreed that new specific resources would be valuable in the teaching of sleep, 43% were unsure while 19% thought not. Suggestions for potentially valuable resources included a national 'sleep syllabuses, on-line case presentations and links to educational material'.

Is enough time is allotted for teaching about sleep and its disorders, and why?

50% said Yes, 38% No, 13% were unsure. We include representative responses in the box.

	Box: Free-text explanations to Q.9: "Do you feel that sufficient time is allotted for teaching about sleep and its disorders and why?"
Yes	"All specialists demand more curriculum time, but students must cover an enormous range of competing topics" "Given the pressures on time in the syllabus I don't think a specific module on sleep could be justified" "A special study module is preferable to further over-crowding the curriculum" "Difficult to quantify as it appears at various points in the curriculum"
Don't Know	"A tough question: curricula are crowded, and I think basic science of sleep is important, then most sleep disorders could be left to postgraduate"
No	"Two hours of lectures + experiential teaching + a student selected component is not nearly enough" "There should be more, but it's always a balance" "Probably not, but it is unclear when GP placement exposes students sleep medicine: it is mostly opportunistic"

	"Given prevalence and morbidity associated with sleep disorders it is under represented" "No sleep related teaching at all at the moment" "An important area of medicine that requires integrating alongside a variety of specialty placements and is therefore often forgotten" "One hour is not enough!"

Sleep research involvement, and presence of a sleep clinic:

29% were involved in sleep research, 47% were not, 26% were unsure. 73% had a local sleep clinic, 14% did not, 14% were unsure. Of those with a sleep clinic, 71% stated students were not routinely sent there.

Thematic analysis of free text

We identified six major themes in the free text answers (table 2). Sleep medicine is usually **subsumed** into other topics, most often respiratory medicine. This theme occurred in around half the responses: for example teaching was "likely to be covered in respiratory system teaching" or students "will have some access as part of ENT". Thus, sleep medicine was implicitly or explicitly framed as a part of another curricular area, without a separate identity. **Uncertainty** was a common theme with around half of responses repeatedly using the words 'likely', 'maybe' or 'probably', or failing to commit to answers. In total 18% of all coded answers were "Don't know", and 30% were left blank. For instance, the assessment questions revealed considerable uncertainty about whether sleep medicine beyond OSA would be addressed or not. Shared ownership of the topic was often cited as a reason for the difficulty in specifying when and where sleep medicine was taught. **Enthusiasm** for the topic was evident in 10 responses, several indicating that sleep medicine should play a larger part in the undergraduate curriculum. However, almost as many took the view that sleep medicine should be regarded an **optional** element. **Obstructive sleep apnoea (OSA)** was often identified as the key element of sleep medicine. Around a quarter of responses expressed **inertia**, and pessimism about the prospects of improving education in sleep medicine given the other pressures on the syllabus.

Table 2: Themes

Theme	Description	Count
Subsumed	Sleep medicine is taught through other topics, and absorbed into them.	12
Uncertainty	Responses were non-committal, associated with imprecise or uncertain answers.	12
Enthusiastic	A priori enthusiasm or an interest in following up, such as accessing resources.	10

Optional	Substantial parts of sleep medicine were optional, either as SSUs or relying on opportunistic teaching.	9
OSA	OSA is implied as the core, or only, element of sleep medicine in the course.	9
Inertia	Expressed obstacles to changing the current teaching system.	7

Table 2: Six major themes from free-text responses were derived from thematic analysis, with the frequency of the theme's appearance amongst the 25 responses. OSA = Obstructive sleep apnoea.

Discussion

Statement of principal findings

We surveyed sleep medicine education in undergraduates, twenty years after Stores and Crawford reported the median duration of formal teaching on sleep was 15 minutes. Response rate was 74%. The median duration of sleep education has risen to 1.5 hours, a six-fold improvement, but remains low. Only two medical schools had a compulsory sleep module or syllabus, suggesting a lack of integrated knowledge assessment related to specified learning goals. Sleep research is the exception rather than the rule. These findings are expanded in free-text comments made by our respondents: sleep medicine is typically *subsumed* into teaching by other specialties, with the result that course directors are *uncertain* about the details of provision; *obstructive sleep apnoea* is often identified as the key or only relevant sleep disorder to undergraduates, knowledge of sleep disorders is regarded as *optional*, and there is *inertia* about the prospect of change. However, a substantial minority of respondents are *enthusiastic* about making improvements to the sleep education they currently provide, and keen to make use of additional resources. Some examples of good practice exist already, with one school offering an optional 30-hour sleep medicine module, but this is only available for 12 students a year.

Strengths and weaknesses of the study

This is the only recent evaluation of sleep medicine teaching in the UK. The high response rate suggests the data will be representative of the current state of sleep education. Time spent on teaching is used as a proxy for competence in doctors, but the latter may vary depending on the students and the type of activity. We couldn't assess the level of knowledge that doctors graduate with or go on to develop.

The true time spent on teaching sleep medicine may be underestimated by our study, because of the multidisciplinary handling, and uncertain ownership of the topic possibly obscuring an occult coverage of the area in some cases, although this seems unlikely. If teaching of the subject were mostly ad-hoc and consequently obscured from oversight then this would be another, distinct concern for the health

of undergraduate sleep education. Organised teaching with oversight of aims and outcomes is positive for education, and without it the scope for variability, inconsistency and gaps is large.

Strengths and weaknesses in relation to other studies, discussing important differences in results

Similar studies have addressed this question in other countries, the largest and most recent looking at numerous countries worldwide (including USA but not the UK) (Mindell et al., 2011); it reported an average of 2.5hr teaching about sleep (compare to 3.2hr in our study), and that paediatric topics were less well represented than adult ones (we found paediatrics was the second worst represented sub-topic). We did not assess knowledge – as opposed to teaching - of sleep disorders, but a survey in the USA examined fully qualified doctors, and found it was poor (Youngren, Miller, & Davis, 2019); this additional insight suggests that post-graduate training there does not comprehensively fill the knowledge gap from medical school.

Meaning of the study: possible explanations and implications for clinicians and policymakers

This study shows that, given the prevalence and impact of sleep disorders, sleep education in UK medical schools is under-provided and poorly structured. Probable explanations include competition for space in the curriculum from other, better established, disease topics; limited awareness of sleep medicine among curriculum makers; limited expertise with which to create and manage education in sleep disorders; and inertia.

The impact of insubstantial sleep teaching at medical school on the future interests and specialisation preferences of future doctors will be to thin out all but the most passionate. Having fewer interested doctors may contribute to the lingering impression amongst the profession as a whole that, as noted here, sleep medicine is considered optional or non-essential to good care, thus creating a cycle of neglect.

The need for effective care of sleep disorders is growing and exceeding the supply of sleep specialists. A gold standard for sleep education should be more than time spent teaching. The best organisations for teaching would appear to be those with active specialists, research, and purpose made course material for students. To improve sleep education, we would promote assessable competence in students, because that better conveys benefits to patients and enables surveillance of educational standards. In line with existing proposals for change in the USA (Salas et al., 2018), we recommend that UK medical schools should adopt and implement a basic ‘sleep curriculum’. The multi-speciality nature of sleep makes collaboration vital: a sleep specialist or champion would be invaluable in coordinating implementation. This will ensure that future doctors have a working knowledge of how to identify, diagnose, and manage the common sleep disorders. Patients with sleep disorders, and

society more broadly, will benefit from this growth in expertise among their doctors. We propose such a curriculum in Appendix 1 below. We should not let another twenty years pass before responding to the findings of this survey.

Unanswered questions and future research

The true competence of graduating doctors in sleep medicine is unknown, so further work including evaluating impact of changes to education should audit this against agreed standards (for an example of such standards, a summary of topics used in exams was prepared by Smith (Smith, 2018)).

Legends

Figure 1: Flow chart of survey response handling.

Figure 2: Distribution of estimated hours of teaching time spent on sleep medicine across UK medical degree courses.

Figure 3: Proportions of sleep-related topics covered in current UK medical education; answering the question “Please indicate which of the following topic areas are covered in your curriculum“, responding yes, no or don’t know.

Box: Free-text explanations to Q.9: “Do you feel that sufficient time is allotted for teaching about sleep and its disorders and why?”

Table 1: Responding Medical Schools.

Table 2: Six major themes from free-text responses were derived from thematic analysis, with the frequency of the theme’s appearance amongst the 25 responses. OSA = Obstructive sleep apnoea.

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Appendix 1: A core sleep medicine curriculum:

I Basic sleep biology

i. The three 'states of consciousness': Wake vs non-rapid eye movement (NREM) vs rapid eye movement (REM) sleep – behavioural features and basic distinctions

ii. Control of conscious states: anatomy, physiology, pharmacology

iii. Sleep drive: circadian rhythm and sleep homeostasis

II Assessing sleep and sleepiness

i. The Epworth Sleepiness Scale

ii. Respiratory sleep studies

iii. Polysomnography and MSLT

III Sleep disorders - basics of classification, clinical features, diagnosis and management

i. Hypersomnia

◊ Insufficient sleep and its effects

◊ OSA

◊ Narcolepsy

ii. Insomnia

◊ Acute insomnia

◊ Chronic psychophysiological insomnia

iii. Parasomnias

◊ SWS parasomnias

◊ RBD

◊ PLMS (and RLS)

◊ Sleep paralysis

iv. Epilepsy (as a differential diagnosis)

IV Disordered sleep secondary to other medical and psychiatric disorders

◊ Neurodegenerative disorders e.g. Parkinson's disease

◊ Anxiety and depression

◊ Psychosis

Appendix 2: Survey letter sent to medical schools

Sleep education in the medical profession – where are we now?

Dear…….

You were contacted previously by my colleague from the Royal Devon and Exeter NHS trust. Thank you for showing interest in taking part in a research study entitled: Sleep education in the medical profession – Where are we now?

I am a Sleep Physiologist at the Royal Devon and Exeter NHS Foundation Trust and am working in collaboration with Oxford and Exeter Universities to assess the provision of sleep medicine education for medical students in order to update our current knowledge.

The enclosed questionnaire (via the survey monkey link) has been designed to collect information on medical student curricula that specifically relate to sleep medicine.

Your participation in this research project is completely voluntary. You may decline altogether, or leave blank any questions you don't wish to answer. There are no known risks to participation beyond those encountered in everyday life. Your responses will remain confidential and would be anonymised in any publication. Data from this research will be kept under lock and key. No one other than the researchers will know your individual answers to this questionnaire.

If you agree to participate in this project, please click on the survey monkey link and answer the questions as best you can. It should take approximately 15 minutes to complete. If there is no teaching about sleep and its disorders in your course, please indicate this in question 1 and return anyway.

If you would prefer not to fill in the questionnaire, please let us know.

Thank you very much for taking the time to fill in the questionnaire. Your comments will help us to provide better sleep medicine education for medical students in the future**.**

_____

- Name of respondent
- Name of your Medical School
- Your Department
- Your position in the Medical School
- Address
- Phone number
- Email
- Title of the course for which you have responsibility

_____

1. How much total time is spent in your own curriculum teaching about sleep medicine?

_____hours

2. Do you have a dedicated sleep syllabus or module? Yes/No

3. Please indicate which of the following topic areas are covered in your curriculum and, if covered, the approximate time allotted to each:

	Covered Yes/No	Total time (hours)
• The biology of sleep		
• Respiratory sleep disorders		
• Hypersomnias (non-respiratory)		
• Parasomnias		
• Insomnia		
• Circadian Rhythm Disorders		
• Sleep disorders in children		
• Sleep disorders in general medicine		
• Sleep disorders in psychiatry		
• Other sleep disorders (please specify) …….		
• Sleep diagnostics and investigations		
• Management of sleep disorders		
• Anything else (please specify)……		

(4) How are students assessed on these topics?

- Essays (coursework) Yes/No
- Essays (examination) Yes/No
- Multiple Choice Questionnaire Yes/No
- Other (please specify)

(5) What type of teaching format is used for teaching of this material?

- Large lecture (>50 students) Yes/No
- Small lecture (<50 students) Yes/No
- Seminar groups Yes/No
- Self-instruction Yes/No
- Case Studies Yes/No
- Clinical/bedside teaching Yes/No
- Web based modules Yes/No

- Other (please specify)

(6) Do you use specific sources for your teaching? If so, what recommendation do you make?

- Sources:
- Text book Yes/No
- Chapters Yes/No
- Articles Yes/No
- Other (please specify)….
- Recommendations (if any)……

(7) Do you use instructional materials in your teachings?

- Video Yes/No
- Slide presentations Yes/No
- Websites Yes/No
- Other (Please specify)….

(8) Are there any specific resources or teaching materials that would improve or complement your current teaching in this area? (Please describe)

(9) Do you feel that sufficient time is allotted for teaching about sleep and its disorders? If not, what are the reasons?

(10) Is your medical school currently involved in sleep research? (Please describe)

(11) Is there a sleep clinic in your area? Yes/No

If so, do your students visit it as part of their teaching? Yes/No

(12) Please feel free to add any comments about this questionnaire or our survey in general

THANK YOU VERY MUCH FOR YOUR CO-OPERATION

You will be sent a summary of the results of this study for your information.